

# Nutrition

By Harold F. Hintz

**P**roper nutrition is essential for the health of horses. Deficient or imbalanced rations or poor feeding management can cause deficiency diseases, decreased resistance to infectious diseases, predisposition to lameness, decreased performance, and digestive problems such as colic and enterotoxemia.

*Digestion*—the process which releases nutrients from feeds for use by the body—begins in the mouth where food is ground and mixed with saliva. Proper dental care such as floating of teeth is necessary so food is chewed properly. Food then travels to the stomach where the chemical breakdown starts.

The horse's stomach is relatively small and horses

seldom vomit. Overfeeding can cause distention of the stomach and signs of colic (a general name for abdominal pain). Horses fed large amounts of grain should be fed two or more times daily, to reduce the incidence of colic.

The small intestine is a major site of digestion and absorption of many nutrients. Good parasite control is necessary for optimum function of the small intestine. Parasites not only reduce feed utilization, but can cause colic.

The large intestine consists of the cecum and colon. It has a large population of micro-organisms (bacteria and protozoa) which digest the fiber in plant materials. If feed changes are made rapidly, the micro-organisms do not have time to adapt. Excessive gas production, colic, and diarrhea may result; so make changes gradually. A change period of 10 days is best, but 5 may suffice.

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USDA

*A hard-working race horse may require more grain than average to meet its energy requirements.*

### Nutrient Guidelines

The horse requires energy, protein, vitamins, minerals, and water. Overfeeding and underfeeding of energy are two of the most common feeding mistakes. Forages—such as hay and pasture—and grains are the most frequent sources of energy.

Grains usually contain 40 to 60 percent more energy per pound of dry matter than do forages. But forages may contain adequate concentrations of energy to supply the energy needs of some classes of horses.

A non-pregnant, non-lactating mature horse that is not working hard could maintain body weight if fed 1½ to 2 lbs of hay per 100 lbs of

body weight. A pregnant mare (last third of gestation) may require some grain, perhaps ¼ to ¾ lb per 100 lbs of body weight in addition to hay. The intake of hay may also slightly decrease because the fetus fills up some of the body cavity. But some pregnant mares can obtain all the energy needed from good quality hay.

The amount of energy required by the lactating mare depends on the amount of milk she is producing. An average mare may require ¾ to 1 lb of grain per 100 lbs of body weight in addition to hay or pasture.

A hard working horse such as a racehorse at the track may need 1½ lbs of

grain and 1½ lbs of hay per 100 lbs of body weight. Rapidly growing foals may eat ¾ lb of hay and 1½ lbs of grain per 100 lbs of body weight.

The above guidelines are only rough estimates. There is considerable variation in energy metabolism among horses. The energy content among hays varies greatly. Energy requirements differ according to environmental temperature.

The eye of the feeder is important. If the horses are too fat, decrease the amount of grain; if too thin, feed more grain.

Keeping records of body weight obtained from scales or by estimating with tapes around the heart girth can be very useful when evaluating a feeding program.

**Protein** is needed for maintenance and for production of new tissue. A deficiency of protein decreases rate of gain, causes a rough hair coat, and decreases appetite.

The young horse requires the greatest concentration of protein in the ration. The National Research Council recommends that horses weaned at 3 months of age be fed diets containing at least 16 percent protein and horses weaned at 6 months need 14.5 percent.

### Calcium and Phosphorus Requirements\* of Horses

	Ca	P
	Percent	Percent
Maintenance	.3	.2
Pregnant or lactating mare	.45	.3
Weanlings	.7	.5
Yearlings	.5	.35

\*Percent of air dry feed

Mature horses at maintenance need only 8 percent protein. Pregnant or lactating mares need 11 to 12.5 percent protein. Work does not greatly increase the protein requirement.

Proteins are composed of smaller units called amino acids. Feed protein is digested in the intestine, and the amino acids are absorbed and used to form protein in the animal's body. Feed proteins that contain a good mixture of amino acids are called "high quality" proteins, those with a poor mixture are called "low quality" proteins.

Soybean meal is a reasonable source of amino acids for horses. Other vegetable protein sources such as cottonseed meal and linseed meal contain a lower concentration of the amino acid lysine than that found in soybean meal.

### Horses: Requirements, Functions, and Deficiency Signs of Some Minerals

Mineral (Requirement)	Some functions	Some deficiency signs
Calcium (see first table)	Bone mineral; blood clotting; nerve, muscle, and gland function	Rickets, osteomalacia, NSH, osteoporosis, bones may be soft and easily deformed or broken
Phosphorus (see first table)	Bone mineral, part of many proteins involved in metabolism	Bone disease, decreased growth, reproductive problems, low blood phosphorus
Iron (50 mg/kg) <sup>a</sup>	Part of hemoglobin and some enzymes, oxygen transport	Anemia: lack of stamina, poor growth
Copper (9 mg/kg)	Iron absorption, hemoglobin synthesis, skin pigments, collagen metabolism	Anemia; hair pigment loss; bone disease: swollen joints, deformed thin bones
Magnesium (.1%)	Bone mineral, enzyme activator: energy metabolism	Nervousness, muscle tremors, ataxia, convulsions, mineralization of blood vessels, low serum magnesium
Sodium, potassium, and chloride	Tissue fluid pressure and acid-base balance, passage of nutrients and water into cells, nerve and muscle function	Craving for salt, hyperexcitability, decreased growth rate, loss of appetite
Zinc (36 mg/kg)	Activator of many enzymes	Hair loss, scaly skin, poor wound healing; reproductive, behavioral, and skeletal abnormalities

Iodine (.1 mg/kg)	Thyroid function	Goiter, poor growth, low body temperature, impaired development of hair and skin, foals weak at birth
Manganese (36 mg/kg)	Synthesis of bone and cartilage components, cholesterol metabolism	Reproductive problems: delayed estrus, reduced fertility, spontaneous abortion, skeletal deformities in the newborn
Selenium (.1 mg/kg)	Removal of peroxides from tissues, enzyme activation	White muscle disease, low serum selenium and serum glutathione peroxidase concentration

<sup>a</sup>Units per kg of air dry feed

**Minerals** are required for many functions. Two minerals that are required in greatest amounts are calcium and phosphorus. One of their primary functions is the formation of bone, but they have many other important roles.

An excess of phosphorus decreases calcium utilization and may result in nutritional secondary hyperparathyroidism (NSH) if the diet has a low level of calcium. Horses with NSH have weak bones, become lame, and may have an enlarged head because of invasion of fibrous connective tissue.

Legume hays may contain 1 to 1.5 percent calcium, but grass hay may contain only .3 to .4 percent calcium. Grains contain almost no calcium.

Limestone is an excellent source of calcium for horses. Dicalcium phosphate contains calcium and phosphorus.

**Vitamins** are also required for many functions. Good quality forage is an excellent source of many vitamins. Excess vitamin A and vitamin D can be toxic.

**Water** is frequently neglected. Clean, fresh water should be provided.

### Horses: Requirements, Functions, and Deficiency Signs of Some Vitamins

Vitamins	Some functions	Some deficiency signs
Vitamin A (2,000 IU/kg) <sup>a</sup>	Growth and development of bone and epithelial cells, vision	Night blindness; poor conception rate, abortion, loss of libido, testicular degeneration; convulsions, elevated cerebrospinal fluid pressure
Vitamin D (250 IU/kg)	Absorption of dietary calcium and phosphorus	Poor mineralization of bone, bone deformities
Vitamin E (15 IU/kg)	Antioxidant in tissues	Decreased serum tocopherol, increased red blood cell fragility; muscular dystrophy
Thiamin (3 mg/kg)	Coenzyme in energy metabolism	Loss of appetite and weight; incoordination, muscular weakness and twitching
Riboflavin (2 mg/kg)	Coenzyme in many enzyme systems	Conjunctivitis, lacrimation, aversion to bright light

<sup>a</sup>Units per kg of air dry feed

#### Further Reading

*Horse Feeding and Nutrition.* T.J. Cunha. Academic Press, Inc., Order Department, Orlando, FL 32887-0015. \$33.00.

*Horse Nutrition: A Practical Guide.* H.F. Hintz. Arco Publishing Co., 215 Park Avenue, South, New York, NY 10003. \$15.95.

*Feeding and Care of the Horse.* L.D. Lewis. Lea and Febiger, Merchandising Department, 600 South Washington Square, Philadelphia, Pa. 19106-4198. \$16.00.

*Nutrient Requirements of Horses.* National Research Council Press, 2101 Constitution Avenue, N.W., Washington, DC 20418. \$5.95.